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Title: Are early childhood disparities narrowing? The changing nature of early childhood and its link to narrowing school-entry achievement gaps

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Abstract Body
Limit 4 pages single-spaced.

Background / Context:

Over the past two decades, a large body of research has demonstrated the importance of early childhood as a uniquely formative period in the lifespan and therefore a period with immense potential for policy initiatives to yield high returns on investment. Recent decades have been characterized by unprecedented policy interest in children's early life experiences, with heightened investments in public preschool expansion and home visitation programs. Similarly, major advocacy initiatives like the "Thirty Million Words Initiative," "Reach out and Read," and former Secretary of State Hillary Clinton's "Too Small to Fail" initiative aim to change the early home environments of low-income children. These efforts are predicated on the notion that important gaps exist in early childhood experiences and that such gaps have major and long-term implications both for individual children and for society.

Despite heightened interest and investment in improving children's early life experiences, we have relatively little evidence about the extent to which children's early years have changed over time. Existing studies suggest that parents' spending on children has been on the rise since the 1970s, and that the increase has been particularly pronounced among high income families (Duncan & Murnane, 2011; Kornrich & Furstenberg, 2013). There is also evidence that parents' time with children has been increasing since the mid-1990s, with the sharpest increase among highly educated families (Ramey & Ramey, 2010).

While these accounts do not focus specifically on *early* childhood, one plausible hypothesis is that similar (and perhaps even more pronounced) patterns have emerged among very young children. In a recent essay, Reardon (2013) describes, "the growing perception that early childhood experiences are central to winning a lifelong educational and economic competition." He hypothesizes that families are increasingly investing in their young children, and that higher-income families may be doing so at rates that outpace middle and low-income families. Consistent with Reardon's claim that early childhood experiences are seen as uniquely important points in children's lives, Kornrich & Furstenberg (2013) demonstrate that prior to the 1990s, parents invested most heavily in their teenage children but in more recent years parents invest most when children are under age six.

On the other hand, three recent studies show that socioeconomic "school readiness gaps" measured at age five have narrowed somewhat between 1998 and 2010 (Bassok & Latham, 2014; Magnuson & Duncan, 2014; Reardon & Portilla, 2015). These findings raise the possibility that perhaps in recent years gaps in children's early-life experiences have actually narrowed.

Purpose / Objective / Research Question / Focus of Study:

To date, no studies have documented how much early childhood experiences have changed over time. In the current study we use two large, nationally representative datasets of kindergarten entrants to document first: how have children's early childhood experiences changed between 1998 and 2010? Second, to what extent have socioeconomic *gaps* in children's early experiences changed over time? And finally, did differential changes in early childhood experiences across sub-groups lead to a narrowing of achievement gaps?

We investigate changes along a diverse set of measures to try to capture wide-ranging measures of early life experiences. These include exposure to preschool, active parental engagement (e.g. joint child-parent activities and outings), home resources (e.g. books in the home, access to a computer), and parenting approaches (e.g. use of disciplinary practices) among others. After carefully documenting the trends over time, we then explore the extent to which these changes are associated with narrowing achievement gaps in literacy and math.

Setting:

We use two nationally-representative samples of incoming kindergarteners.

Population / Participants / Subjects:

The data used in this study come from two large studies conducted by the National Center for Education Statistics (NCES): the original Early Childhood Longitudinal Study, Kindergarten Class (ECLS-K) of 1998-99 and the ongoing ECLS-K of 2010-11. The ECLS-K of 1998-99 (ECLS-K:98) collected data on a nationally-representative sample of approximately 21,400 children who were in kindergarten in Fall 1998 (representing a cohort born in 1992-1993) (Tourangeau et al., 2001). Similarly, the new ECLS-K of 2010-11 (ECLS-K:10) collects data from a nationally representative sample of about 18,170 children who were in kindergarten in Fall 2010 (representing a cohort born in 2004-2005) (Tourangeau et al., 2013). Both studies surveyed the children's parents and teachers, and assessed children's skills, multiple times during kindergarten and elementary school.

Intervention / Program / Practice:

Not applicable. We do not evaluate a particular intervention or program.

Research Design:

Our study seeks to provide descriptive evidence about changing early childhood experiences and their relationship with the emergence of early achievement gaps. We estimate socioeconomic gaps in children's early childhood experiences using a method described in Reardon (2011). In brief, we regress each of our measures of early childhood environment on family income (or education) percentile, using a cubic regression model. From this function, we compute the estimated average value of the indicator for children at the 10th, 50th, and 90th percentiles of the income (or education) distribution. Next, we estimate gaps in each measure separately for the ECLS-K:98 and ECLS-K:10 samples. To examine how *gaps* in early childhood experiences have changed over the study period, we conduct t-tests comparing the predicted values of each of our "early childhood experience" measures at the 10th, 50th, and 90th percentiles of family income.

After describing changes over time in early child experiences, we turn to our final research question: To what extent are changes in early childhood experiences associated with narrowing socioeconomic achievement gaps at school entry. To do this we regress child outcomes (reading and math direct assessments from the fall of kindergarten) on family income, again using a cubic regression model. As we did before, we compute the estimated average

cognitive test scores for children at the 10th, 50th, and 90th percentile. We use these values to estimate the “raw” achievement gaps at each wave, and the difference in the achievement gap across waves.

We then repeat this process multiple times, each time adding different sets of covariates. First, we run models that include a rich set of demographic covariates (parental employment and education, family structure, immigrant status etc.). These models explore the extent to which achievement gaps at each wave are explained by the demographic composition of the sample, and whether demographic changes over this period are associated with the changes in the achievement gaps over time.

Next we consider three sets of early childhood experience variables, selected both for their policy relevance (e.g. preschool participation) and because our analysis suggested substantial shifts over time (e.g. parents’ home literacy practices, internet access and use of home computers for learning activities). A final model includes all these covariates, including the demographic factors simultaneously. Each of these models allows us to assess how much the narrowing achievement gap between 1998 and 2010 is explained changes in children’s early life experiences.

Importantly, there are a number of mechanisms through which changes in early childhood experiences may be associated with changes in achievement gaps. If a particular practice (e.g. reading books to your child) is positively associated with child outcomes, then a narrowing in the frequency of this practice between low and high income families may lead to narrowing in achievement gaps. Alternatively the association between a certain practice and child outcomes may have changed over time. For instance, efforts to improve preschool quality over this period may lead to stronger associations between preschool participation and child outcomes in the second wave relative to the first. Through a series of decompositions (assigning the 1998 coefficients to the 2010 characteristics and vice versa), we provide some suggestive evidence about the extent the role of changing levels versus changing relationships.

Data Collection and Analysis:

Tourangeau et al (2001, 2013) provide a detailed description of data collection at each wave.

Findings / Results:

Tables 1-3 show changes over the study period in children’s child care experiences, their access to a home computer and the frequency of various forms of enriching parental interactions. Although patterns differ somewhat across the many outcomes we consider in our analysis, our overall results indicate that over the period considered, parents at all income levels have increasingly structured their kindergarteners’ lives to be more explicitly focused on engaging learning experiences. Compared to their peers in 1998, kindergarteners in 2010 had more educational resources in the home. They spent substantially more time interacting with their parents, both at home and through engaging excursions. Their parents had higher standards for what it means to be school ready, and they had higher expectations for their kindergarteners’ ultimate educational attainment.

As average exposure to engaging learning experiences has risen, socioeconomic disparities have, in many cases, narrowed. In other words, low- and high-income children in

2010 appear to enter school with a more equal set of experiences than the 1998 cohort. For instance, the top row of Table 2 shows changes across cohorts in the likelihood that the family has a home computer that the child uses. We estimate a 30 percentage point increase in computer access among families at the 10th percentile, a 23 percentage point increase at the 50th percentile, and no change at the 90th percentile. We see similar evidence of narrowing in the frequency with which parents read books to their child or take their child to the library or zoo. These trends are striking, especially in light of the many demographic shifts that might be expected to work *against* such a narrowing. For example, over the period we consider gaps between low and high-income families grew with respect to factors such as maternal age at birth; use of a non-English language at home, attainment of a four-year degree, and full-time employment.

At the same time several aspects of children's early experiences have become increasingly divergent. Patterns of child care usage, for instance, may be growing increasingly unequal. The most pronounced change for lower-income children was a shift from Head Start to parental care, while higher-income children moved to preschool and pre-K (and out of parental care, relative care, or other center-based care).

In Table 4 we show results from models estimating 90-10 reading and math achievement gaps at school entry, after accounting for various combinations of early childhood experience measures. The "raw" gaps we estimate closely correspond to those measured by Reardon & Portilla (2015) and suggest meaningful narrowing in socioeconomic achievement gaps over time. Accounting for any of our sets of early experience measures (i.e. child care, technology, home literacy practices) explains a meaningful portion of this narrowing, and when we account for all three simultaneously we explain more than half of the gap narrowing in both subjects. Notably our decompositions (not shown) provide suggestive evidence that these patterns are driven by narrowing gaps in access to home computers and the internet, narrowing gaps in home literacy practices, and stronger associations between formal child care participation and child outcomes in the later period.

Conclusions:

Gaps in school readiness have narrowed between 1998 and 2010 (as found by Bassok & Latham, 2014; Magnuson & Duncan, 2014; Reardon & Portilla, 2015). There are a variety of plausible explanations for this narrowing (e.g. heightened investment in public preschool) but to date there has not been empirical evidence on changes in children's early life experiences have changed over time. We leverage newly-available nationally representative data to fill this gap.

Our results provide compelling new evidence that many forms of parental investments increased substantially between 1998 and 2010. Although these increases occurred among both low and high-income children, in many cases they were largest among the lowest-income children, and may have contributed to narrowing achievement gaps.

Some factors that may have impacted school readiness over this period are excluded from our analysis (e.g. expansions in child health insurance, improvements in the quality of preschool programs). Further, our analysis is descriptive in nature. Our goal was to generate hypotheses about the potential drivers of the achievement gap narrowing, rather than to estimate the *causal impact* of any one candidate explanation. That said our results indicate that changes in observed early childhood experiences are associated with narrowing achievement gaps; roughly half of the gap reduction in school-entry test scores is eliminated when we include these measures in our analysis.

Appendices

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Appendix A. References

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Appendix B. Tables and Figures

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Table 1. Child Care Arrangements at 10th, 50th, and 90th Percentiles of Income, 1998 and 2010

	10 th percentile			50 th percentile			90 th percentile		
	1998	2010	Change	1998	2010	Change	1998	2010	Change
Head Start	0.352	0.277	-0.075***	0.101	0.132	0.032***	0.016	0.047	0.030***
Preschool/prekindergarten – public school	0.091	0.094	0.003	0.072	0.107	0.036***	0.030	0.060	0.030***
Preschool/prekindergarten – other place	0.070	0.100	0.030***	0.061	0.117	0.056***	0.023	0.089	0.065***
Other center-based care	0.147	0.114	-0.033***	0.416	0.319	-0.097***	0.747	0.637	-0.111***
Relative/non-relative care	0.112	0.096	-0.016†	0.136	0.105	-0.032***	0.074	0.046	-0.028***
Parental care	0.227	0.314	0.087***	0.207	0.213	0.007	0.106	0.123	0.017†

Note. Sample sizes, which were rounded to the nearest to 10 due to the NCES' reporting rules, were 18,940 and 14,850 in the analytic samples of ECLS-K98 and ECLS-K10, respectively. The estimates of ECLS-K98 were adjusted using the 1999 spring kindergarten child weight, and the estimates of ECLS-K10 were adjusted using the 2010 fall kindergarten child weight.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2. Educational Resources in the Home at 10th, 50th, and 90th Percentiles of Income, 1998 and 2010

	10 th percentile			50 th percentile			90 th percentile		
	1998	2010	Change	1998	2010	Change	1998	2010	Change
Family has a home computer at SK (%)	0.225	0.525	0.301***	0.545	0.779	0.234***	0.852	0.861	0.010
Use of computer three or more times/week	0.118	0.223	0.105***	0.294	0.339	0.045***	0.433	0.401	-0.032**
Use of computer for reading/math skills	0.181	0.437	0.256***	0.480	0.679	0.198***	0.779	0.744	-0.034*
Use of computer for the internet	0.020	0.299	0.279***	0.066	0.495	0.429***	0.102	0.577	0.475***
Number of books that child own at FK	41.328	52.351	11.024***	73.848	86.382	12.535***	104.016	130.411	26.395***

Note. Sample sizes, which were rounded to the nearest to 10 due to the NCES' reporting rules, were 18,940 and 14,850 in the analytic samples of ECLS-K98 and ECLS-K10, respectively. The estimates of ECLS-K98 were adjusted using the 1999 spring kindergarten child weight, and the estimates of ECLS-K10 were adjusted using the 2010 fall kindergarten child weight. FK = Fall kindergarten; SK = Spring kindergarten.

† $p < .10$. *** $p < .001$.

Table 3. Enriching Activities at 10th, 50th, and 90th Percentiles of Income, 1998 and 2010

	10 th percentile			50 th percentile			90 th percentile		
	1998	2010	Change	1998	2010	Change	1998	2010	Change
Activities at home in a typical week at FK (%)									
Frequency that child reads to others	0.660	0.672	0.012	0.688	0.717	0.029**	0.712	0.760	0.048***
Frequency that child looks at picture books	0.706	0.716	0.010	0.824	0.822	-0.002	0.888	0.886	-0.002
Reading books to child	0.655	0.753	0.098***	0.818	0.868	0.050***	0.924	0.937	0.013
Telling stories to child	0.499	0.594	0.095***	0.553	0.721	0.168***	0.617	0.779	0.162***
Singing songs with child	0.690	0.715	0.025†	0.717	0.736	0.019†	0.740	0.727	-0.013
Helping child do arts/crafts	0.472	0.574	0.102***	0.533	0.592	0.059***	0.590	0.628	0.038**
Involving child in household chores	0.725	0.745	0.020	0.801	0.789	-0.011	0.803	0.806	0.003
Playing games/doing puzzles with child	0.551	0.610	0.059***	0.608	0.660	0.052***	0.673	0.704	0.031**
Talking about nature/doing science projects	0.254	0.316	0.062***	0.306	0.340	0.034***	0.375	0.368	-0.007
Building something with child	0.367	0.413	0.047**	0.381	0.446	0.065***	0.399	0.462	0.063***
Playing a sport or exercise together	0.517	0.583	0.066***	0.540	0.624	0.085***	0.590	0.640	0.050***
Out-of-home activities in the past month at SK (%)									
A library	0.411	0.541	0.129***	0.535	0.588	0.052***	0.627	0.639	0.012
A concert	0.285	0.322	0.038**	0.369	0.393	0.024*	0.470	0.496	0.026†
A zoo	0.375	0.462	0.087***	0.388	0.448	0.060***	0.465	0.493	0.027
A museum	0.221	0.278	0.057***	0.284	0.327	0.043***	0.423	0.435	0.013
Dance lessons	0.072	0.085	0.013	0.145	0.166	0.021*	0.301	0.314	0.013
Organized athletic activities	0.200	0.271	0.071***	0.444	0.493	0.049***	0.713	0.765	0.051***
Organized clubs, like scouts	0.073	0.054	-0.020**	0.130	0.124	-0.006	0.191	0.181	-0.010
Music/singing lessons	0.044	0.051	0.007	0.056	0.077	0.020**	0.137	0.171	0.034**
Drama lessons	0.009	0.016	0.007†	0.009	0.015	0.006†	0.030	0.036	0.007
Art classes/lessons	0.047	0.075	0.028**	0.053	0.067	0.014†	0.128	0.143	0.014
Crafts classes/lessons	0.056	0.081	0.025**	0.096	0.099	0.003	0.170	0.160	-0.010
Organized performing arts	0.098	0.101	0.003	0.142	0.145	0.002	0.196	0.207	0.011

Note. Sample sizes, which were rounded to the nearest to 10 due to the NCES' reporting rules, were 18,940 and 14,850 in the analytic samples of ECLS-K98 and ECLS-K10, respectively. The estimates of ECLS-K98 were adjusted using the 1999 spring kindergarten child weight, and the estimates of ECLS-K10 were adjusted using the 2010 fall kindergarten child weight. Indicators for in-home activities were binary ones (3 or more times/week = 1); indicators for out-of-home activities were binary ones (yes = 1). FK = Fall kindergarten; SK = Spring kindergarten.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. 90/10 Income Gaps in Reading and Math Scores at Kindergarten Entry, 1998-2010

	90/10 income gap				Change in gap, 1998-2010		
	1998 <i>M</i>	<i>SE</i>	2010 <i>M</i>	<i>SE</i>	Change <i>M</i>	<i>SE</i>	Change from M1
Reading scores							
(M1) Raw Gap	1.235	0.027	1.053	0.026	-0.182***	0.038	
(M2) M1 + Demographic controls	0.494	0.034	0.288	0.041	-0.206***	0.053	
(M3) M2 + Child care arrangements	0.399	0.036	0.248	0.041	-0.151**	0.054	0.055
(M4) M2 + Home computing	0.423	0.034	0.260	0.041	-0.163**	0.053	0.043
(M5) M2 + Home literacy environment	0.426	0.032	0.254	0.040	-0.172***	0.051	0.034
(M6) All covariates	0.293	0.033	0.199	0.039	-0.094†	0.052	0.112
Math scores							
(M1) Raw Gap	1.298	0.022	1.175	0.028	-0.123***	0.035	
(M2) M1 + Demographic controls	0.494	0.030	0.332	0.040	-0.162**	0.050	
(M3) M2 + Child care arrangements	0.406	0.031	0.282	0.039	-0.124*	0.050	0.038
(M4) M2 + Home computing	0.423	0.030	0.300	0.039	-0.123*	0.049	0.038
(M5) M2 + Home literacy environment	0.427	0.030	0.296	0.039	-0.130**	0.049	0.032
(M6) All covariates	0.298	0.031	0.226	0.038	-0.072	0.049	0.090

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.